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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/803,152	03/12/2001	Kouichi Shimamura	1095.1165	3265

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EXAMINER	
AKHAVANNIK, HUSSEIN	
ART UNIT	**PAPER NUMBER**
2621	

DATE MAILED: 01/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/803,152	SHIMAMURA ET AL.	
	Examiner	Art Unit	
	Hussein Akhavannik	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 and 6 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 and 6 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 12 March 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The cancellation of claim 5 overcomes the 35 USC 112, second paragraph rejection of this claim cited in paragraph 2 of the previous office action (mailed 03/22/2004).

Response to Arguments

2. Applicant's arguments, on page 4, line 30 to page 5, line 3 of the Remarks, filed 08/23/2004 have been fully considered but they are not persuasive.

The Applicant alleges, on page 4, lines 30-31, that neither Kobayashi et al, Cline et al, or Applicant's admitted prior art teach an edge detecting unit which detects an edge of the three-dimensional model. The Examiner respectfully disagrees. Kobayashi et al explain that each edge line of the model is assigned to a coordinate axial direction in column 3, lines 41-60, inherently requiring that each edge of the model be detected. Furthermore, Cline et al explain in column 2, lines 55-67 that post-processing algorithms discern boundaries (corresponding to detecting edges) of 3D structures in order to segment different structures in an image. Cline et al give the example of segmenting a vessel wall from a blood pool in order to determine blockage of the vessels. Cline et al explain in column 2, lines 49-54 that the visualization of boundaries of objects is useful in many disciplines, such as the 3D model analyzing system of Kobayashi et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to detect edges of the 3D model inputted in the system of Kobayashi et al using the method suggested by Cline et al because both systems analyze edges of 3D objects and the edge detection method of Cline et al would improve the accuracy of the segmentation of the 3D model.

The Applicant alleges, on page 4, line 31 to page 5, line 3, that neither Kobayashi et al, Cline et al, or Applicant's admitted prior art teach a number-of-divisions varying unit which varies the number of said plurality of hexahedral elements and the analyzing unit determining a converged value of the physical quantity based on a local maximum of calculated values of the physical quantity which are obtained while increasing the number of the plurality of hexahedral elements by the number-of-divisions varying unit. The Examiner respectfully disagrees. The Applicant illustrates in figure 10 (labeled prior art) that the number of divisions are varied (on the x-axis) in order to determine the major principle stress. The number of divisions is inherently varied by a number-of-divisions varying unit in the admitted prior art. Furthermore, the Applicant illustrates in figure 10 by the dashed line that the major principle stress converges to an asymptote. The local maximum of the calculated values (corresponding to the major principle stress) occurs at the largest number of divisions illustrated in figure 10. The number of divisions illustrated in figure 10 is not infinite and therefore, the maximum value is local to the number of divisions analyzed. By using the physical property analyzing method of the admitted prior art, features of the 3D model of Kobayashi et al and Cline et al may be determined. Therefore, it would have been obvious to one of ordinary skill in art at the time the invention was made to analyze the 3D model of Kobayashi et al and Cline et al by the method of the admitted prior art because the characteristics of the models can be analyzed.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (U.S. Patent No. 5,892,515) in view of Cline et al (U.S. Patent No. 6,204,853), and further in view of Applicant's admitted prior art.

Referring to claim 1, which is representative of claim 6,

i. An information receiving unit which receives information on a three-dimensional model as an object to be analyzed is illustrated by Kobayashi et al in figure 1 by the input/output data processing unit 102. Kobayashi et al explain that the models are 3D in column 8, lines 58-61 and illustrate example models in figures 3 and 4.

ii. An edge detecting unit which detects an edge of the three-dimensional model is not explicitly explained by Kobayashi et al. Kobayashi et al do explain that each edge line of the model is assigned to a coordinate axial direction in column 3, lines 41-60, inherently requiring that each edge of the model be detected. However, Cline et al explain in column 2, lines 55-67 that post-processing algorithms discern boundaries of 3D structures in order to segment different structures in an image. Cline et al give the example of segmenting a vessel wall from a blood pool in order to determine blockage of the vessels. Cline et al explain in column 2, lines 49-54 that the visualization of boundaries of objects is useful in many disciplines, such as the 3D model analyzing system of Kobayashi et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to detect edges of the 3D model inputted in the system of Kobayashi et al using the method suggested by Cline et al because both

systems analyze edges of 3D objects and the edge detection method of Cline et al would improve the accuracy of the segmentation of the 3D model.

iii. A smoothing unit which smoothes the edge is not explicitly explained by Kobayashi et al. However, Cline et al illustrate in figure 4 by the noise reduction filter 27 and explain in the abstract that a smoothing unit is used in order to smooth the detected edges. The smoothing filter of Cline et al reduces noise in the image, especially along the edges, without blurring across the edge. Noise present near the edges of the 3D model could create artifacts in the 3D model due to falsely detected edges. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to smooth the edges of the 3D model because artifacts will be reduced and a more accurate 3D will be generated.

iv. An analyzing unit which analyzes the three-dimensional model in accordance with a finite element method after the edge is smoothed by the smoothing unit is illustrated by Kobayashi et al in figure 1 by the finite element mesh generating unit 104. An example of an input 3D model being analyzed in accordance with the finite element method is illustrates by Kobayashi et al in figures 5 and 6.

v. The analyzing unit analyzing the three-dimensional model in accordance with the finite element method after dividing the three-dimensional model into a plurality of hexahedral elements which are formed with edges each having a length shorter than the predetermined radius of curvature is explained by Kobayashi et al in column 11, lines 36-45. Kobayashi et al illustrate that the 3D models are divided into hexahedral elements in figures 5,6, and 10. Kobayashi et al also explain that the length of the line segments of

the mapping models, corresponding to the radius of curvature, is longer than the length of the hexahedral elements.

vi. A number-of-divisions varying unit which varies the number of said plurality of hexahedral elements is not explicitly explained by Kobayashi et al or Cline et al. However, the Applicant illustrates in figure 10 (labeled prior art) that the number of divisions are varied (on the x-axis) in order to determine the major principle stress. The number of divisions is inherently varied by a number-of-divisions varying unit in the admitted prior art.

vii. The analyzing unit determining a converged value of the physical quantity based on a local maximum of calculated values of the physical quantity which are obtained while increasing the number of the plurality of hexahedral elements by the number-of-divisions varying unit is not explicitly explained by Kobayashi et al or Cline et al. However, the Applicant illustrates in figure 10 by the dashed line that the major principle stress converges to an asymptote. The local maximum of the calculated values (corresponding to the major principle stress) occurs at the largest number of divisions illustrated in figure 10. The number of divisions illustrated in figure 10 is not infinite and therefore, the maximum value is local to the number of divisions analyzed. Claim 5 does not require that the value of the physical quantity decrease after the local maximum. By using the physical property analyzing method of the admitted prior art, features of the 3D model of Kobayashi et al and Cline et al may be determined. Therefore, it would have been obvious to one of ordinary skill in art at the time the invention was made to analyze

the 3D model of Kobayashi et al and Cline et al by the method of the admitted prior art because the characteristics of the models can be analyzed.

Referring to claim 2, the edge detecting unit detecting only at least one edge having an angle which does not exceed a predetermined amount is explained by Kobayashi et al in column 19, line 50 to column 20, line 8. Kobayashi et al explain that the line segments (corresponding to edges) are constrained according to a desired direction (corresponding to an angle).

Referring to claim 3, the smoothing unit transforming the edge into a curved surface having a predetermined radius of curvature is not explicitly explained by Kobayashi et al. However, Cline et al explain that the smoothing filter employs a predetermined curvature (corresponding to the inverse of the radius) in column 3, lines 6-35 and illustrate the curvature in figure 2. Cline et al explain that the curvature is important so that edges are not blurred, thereby enhancing the edge. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to transform an edge into a curved surface having a predetermined radius as suggested by Cline et al in the finite element analyses system of Kobayashi et al because the edges will be enhanced, resulting in a more accurate 3D model.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik HA.
January 15, 2005

ANDREW W. JOHNS
PRIMARY EXAMINER